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Abstract

The purpose of this investigation was to survey all major league baseball teams to determine how prevalent visual training is among these organizations. Of the twenty-six teams, twenty-one responded (81%) to the questionnaire. Two organizations are currently using a visual training program, two had a program and discontinued it, fourteen had never had a program, and three teams failed to provide information about the visual training program. Ten of the responding teams did not even have a visual consultant. The paper also defines certain visual abilities and provides evidence that these abilities are trainable, relates these abilities to their use in athletics, and cites instances where optometrists are consultants to athletic teams.

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THE ROLE OF VISUAL TRAINING IN PROFESSIONAL BASEBALL

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ABSTRACT

The purpose of this investigation was to survey all major league baseball teams to determine how prevalent visual training is among these organizations. Of the twenty-six teams, twenty-one responded (81%) to the questionnaire. Two organizations are currently using a visual training program, two had a program and discontinued it, fourteen had never had a program, and three teams failed to provide information about the visual training program. Ten of the responding teams did not even have a visual consultant. The paper also defines certain visual abilities and provides evidence that these abilities are trainable, relates these abilities to their use in athletics, and cites instances where optometrists are consultants to athletic teams.

VISION ABILITIES AND TRAINABILITY

Using a performance rating scale it was demonstrated that optometric vision therapy does produce positive changes in visual functioning.[1] The specific visual abilities that will be discussed are stereopsis or binocularity, ocular motility, accommodation/convergence, spatial perception/visualization, and hand-eye-body coordination.

Stereopsis can be defined as the perception of three-dimensional visual space (depth) due to binocular clues arising from retinal disparities. Research by Schor and Flom showed that the threshold for stereo-acuity is not the same for all distances.[2] A study by Wittenberg, Brock, and Folsom showed that stereopsis is trainable. They state that "stereoscopic acuity, as clinically or experimentally determinable, is subject to improvement through training. The enhancement of this perceptual skill is not an artifact of measurement methods, but is a valid phenomenon as is demonstrated by the fact that transfer of learning occurs. One, thus, cannot take a deterministic view of stereoscopic acuity but must acknowledge dynamic neural processing of binocular parallactic clues, a processing which can be affected by the exercise of that judgement."[3] Stereopsis was also shown to be trainable in a paper by Wold, Pierce, and Keddington. In one hundred consecutive optometric vision therapy

cases, only 14% passed stereopsis testing procedures (Keystone skills test) while 97% passed the tests after visual training.[4]

Ocular motility is defined as the ability of the eyes to track an object in visual space, either by spontaneous or induced movements. Ocular motilities are characterized by pursuits, saccadic fixations, and rotations. The study by Wold, Pierce and Keddington also showed that significant improvement of ocular motilities can be achieved by visual training. Of the 100 vision training patients, only 6% passed the ocular motility testing procedures but after training 96% of the patients passed the tests.[5] Research by Hoffman, Cohen, and Feuer supports the tenet that ocular motility dysfunctions are amendable by visual training. Out of 129 vision therapy patients, 32 were classified as having a general skills dysfunction and 94% of these patients benefitted from visual training.[6]

Accommodation is defined as the effecting of refractive changes by changes in the shape of the crystalline lens to obtain maximum sharpness of the retinal image of the object of regard. Convergence is defined as the turning inward of the lines of sight toward each other. The Hoffman, Cohen, and Feuer study also showed that optometric vision training yielded a high success rate in training accommodative anomalies and convergence insufficiences. Of the 129 vision therapy patients in the study, 80 had accommodative anomalies and there were 17 with convergence

insufficiences. Of the 80 patients with accommodative anomalies, 88% showed significant improvement after visual training while 87.5% of the patients with convergence insufficiencies showed significant improvement after visual training.[7] The ability to improve the functioning of the accommodative system and convergence system by visual training is supported by the Wold, Pierce, and Keddington study. They showed that visual training significantly improves fusion ability, binocular alignment, vergence ability, accommodative ability, and accommodative facility. Of the 100 visual training patients, 25% passed the fusion tests (Keystone fusion and Keystone phoria stability) initially while 86% passed after vision therapy. Fifty-three percent of the patients passed the binocular alignment tests (analytical phorias and Keystone phorias) and this improved to 83% after training. In regard to vergence ability, 9% of the patients passed the test (analytical vergence) while 75% passed after the therapy. Thirty-nine percent of the patients could pass the accommodative ability test (PRA-#20) which improved to 80% of the patients passing the test after therapy. Only 4% of the patients passed the accommodative facility tests (±2.00D Rock, -2.00D at 20 feet) while 75% could pass after receiving vision therapy.[8]

Spatial perception is the ability to pick an object out of the background environment and make subjective judgments about the object concerning distance, speed, size, and shape. In a

paper by Koch, he states that spatial perception can be trained. Koch goes on to say that "the capacity to see is affected by habits of seeing and may be changed by appropriate experience. This training may also effect the depth of the visual field increasing this depth in both vertical and horizontal meridians. Training may also improve the overall visual perception in a once widened form field. It will enable the trainee to more accurately discriminate the distances which separate himself from objects in a given visual field, as well as the size, shape, brightness, and color of these objects. In addition, it will enable the observer to discriminate more accurately the relative positions of objects in a given visual field when the objects are introduced at variable periods of time." [9]

Visualization is defined as the act or facility of forming a mental visual image of an object not present to the eye. Runninger states in an article that visualization (among other visual abilities) is a learned skill and that learned skills can be improved through visual training.[10] The ability to train visualization is supported in a paper by Getz. He also believes that visualization is a learned skill and hence can be trained to a higher degree. He states that if a person has good visualization, that person will also have a good awareness of space.[11]

Hand-eye-body coordination is defined as the relationship between visual and kinesthetic clues that result in accurate manual spatial localizations. Hoffman, Cohen, and Feuer state

in their study that hand-eye coordination (which they included in a category called general skills) can be successfully improved by vision training. Of 32 patients that had problems with general skills, 94% showed improvement after receiving visual therapy.[12] Koch also reported that visual training to improve kinesthesis resulted in better performance.[13]

There are no age restrictions in training these visual abilities. A study by Wick concludes that age was not a major factor in relating to success of visual training.[14]

Visual Abilities Related To Athletics

"Every sports activity depends on the sense of sight feeding appropriate information to the participant's brain. If this information is not clear, accurate, and rapid, performance will suffer. Patients that play sports should be made aware of the fact that some vision skills can be trained to higher levels."[15]

Good stereopsis or binocularity is a very important skill for the athlete to possess. "In all sports involving movement, the participant must be able to judge quickly and accurately at all times the position and distance from himself to the ball, opponents, and teammates. Accurate depth perception is based on how well an individual's eyes work together."[16] The Schor and Flom study indicated that the threshold for stereo-acuity is not the same for all distances. It showed that at distances less that approximately 10 meters, monocular cues to depth perception are relatively ineffective and therefore as the ball approaches the player, binocularity

and fusion become increasingly important.[17]

Ocular motility is a vision requirement and it is a skill that can be improved through proper training of the control of the eye muscles.[18] The athlete needs the ability to follow a moving object smoothly and easily. If the eyes can't follow the ball in this manner, they can't get the information for judging speed and direction to brain efficiently.[19] An extensive study on ocular motilities in little leaguers demonstrated how important ocular motilities are in baseball. Ocular motilities were defined in this study as the combination of pursuit and saccadic eye movements. Those players that were visually trained showed an increase in batting averages.[20] Another study done on little leaguers by Falkowitz and Mendel supported these findings. They reported that the players with the highest batting averages had smooth and full rotations and accurate eye movements.[21]

Accommodation and accommodative facility are necessary visual abilities for an athlete to possess. The eyes must focus instantaneously for the split-second timing it takes for sports. Getz points out that enough blur is created by just the movement of the ball, so the athlete should not further be handicapped by the additional blur a poor or inflexible accommodative system would create.[22] The accommodation system must be functioning efficiently in order for optimum dynamic visual acuity. Dynamic visual acuity has been shown to have great importance to the performance of athletes. This was pointed out in a study by Beals, Mayyasi, Templeton and Johnston.[23]

The athlete's eyes must also team efficiently in convergence as well as accommodation. The eyes of an athlete must be able to converge more as the ball approaches him/her. The study by Falkowitz and Mendel states that superior hitters had a relatively close convergence nearpoint. Of the top ten hitters who were studied, nine had convergence nearpoints of two inches or better.[24] If the athlete's eyes do not converge easily or accurately focus, his depth perception skill will suffer and will not be able to perform as well as expected.[25]

Getz points out that visualization is one of the most important skills an athlete can possess. If a player has good visualization ability he will have a good awareness of space.[26] Harrison and Reilly state that visualization is a basic skill that is learned and it must be developed adequately before it will be of significant value to players. Most visualizations are based upon prior observations and are only as accurate as those initial observations.* A study testing visual time-space relationships (among other visual skills) by Wolff demonstrated significant improvements in all players who were visually trained.[27]

Various studies have indicated how important hand-eye-body coordination is in the performance of athletes. Koch reported an increase in the performance of athletes after training kinesthetic perception.[28] Runninger also stresses the importance of hand-eye-body coordination. He states that this skill is based on all the other visual skills which furnishes quick and accurate information to the brain so it can give directions to the muscles of the body.[29]

* Harrison B., Reilly RE: Vision Dynamics - Baseball Method - Unpublished paper.

Getz states that athletes who perform significantly better in balance than out of balance may be experiencing visual difficulties. He states that approximately 20% of the nerve fibers that leave the eye do not go to the visual cortex but, rather, go to areas that are involved with body balance. He also states that the balance system can be trained independently of the visual system.[30]

Optometrist's Role In Sports

The need for vision care by athletes was established long ago with a number of optometrists reporting 15-25 percent of the athletes failing rather easy screening standards. But consulting goes beyond screening. Vision training, contact lens fittings and care, education of players and coaches about vision, advice about eye protective devices and on-call service during games can be involved in consulting. It is the optometrist's duty as vision specialists to make these people aware of the benefit of optometric services, and to offer these services in fielding an all-around physically fit athlete.[31]

There are several instances where optometrists are involved in sports programs. An article entitled "The Double Life Of Doctor Thomas", describes the role of an optometrist with the University of Georgia's athletic program. Dr. Thomas points out the important fact that even the athletes themselves are sometimes unaware that they have a visual problem so he instituted screening programs for the players. He further states that anybody that handles the ball benefits from visual training.[32] Dr. David Pollock is the team optometrist of the National Hockey League's Philadelphia Flyers. He maintains that professional players don't have a better visual system than normal. Instead they simply use their visual system more efficiently and that by training, those visual abilities can be finely honed.[33] Dr. Wolff conducted research on the players of the Cincinnati Reds baseball

team testing visual acuity, depth perception, eye movements, and visual time-space relationships. By correcting the player's weaknesses via visual training, Wolff demonstrated improvement in all players who followed the routine he had prescribed.[34]

A.I. Garner of Harrisburg, Pennsylvannia, has been in sports vision for a decade, with some 5,000 screenings for 20 amateur and professional teams to his credit. Dr. Garner states that sports vision accounts for approximately $30,000 of his gross income, and each year this figure keeps increasing as more coaches and athletes become more vision conscious. Jim Carlson is director of the Totem Lake Vision Center in Seattle, Washington, and is involved with sports vision in that area. William A. Bauscher of Caldwell, Idaho, has had long experience providing vision services for athletic teams at the University of Idaho, Boise State University, Northwest Nazarene College, and several junior and senior high schools. Presently, he is a vision consultant to the athletic department at the College of Idaho. He states that all competitive athletic teams would benefit from the expertise of an optometric vision consultant. Timothy A. Wilkins serves as a visual consultant to the California State University at Fresno.

Roderic W. Gillilan and Don E. Jones of Eugene, Oregon, have been serving as optometric consultants to the University of Oregon Athletic Department since 1970. They state that optometric vision services are an essential part of the overall university athletic program. It is doubtful if an athletic department would ever want to be without an optometric consultant once it is discovered what an optometrist can do for the team. Ramon Burstyn of Austin,

Texas, serves as vision consultant to the University of Texas Athletic Department. He states that there are a great many opportunities for optometrists in sports vision. Joshua Breschkin of Baltimore, Maryland, is the vision consultant to the Baltimore Colts professional football team. He states that basics that may have to be developed in the player include a knowledge of accurate hand-eye, foot-eye, foot-hand-eye coordination, well defined binocularity with rapid dependable grasp-release ability, highly developed peripheral vision, good near-point performance, and the ability to visualize.[35] Dr. Wayne Martin has worked with the University of Washington, Seattle Rainers (Pacific Coast AAA baseball), Boston Red Sox, Seattle Totems (Western Hockey League), and the Seattle Supersonics of the National Basketball Association.[36] Marvin Weisman is the visual consultant for his hometown Detroit Lions.[37]

Evidence also indicates that there is a growing awareness of the importance of optimum visual performance by athletes, coaches, and the optometric profession itself. Blanton Collier, the coach of the University of Kentucky until his retirement in 1970, became famous for his concept that "the eyes lead the body." He stated that this concept applies to baseball and basketball as well as football, and built coaching philosophies for his team around this concept. He states that teaching players the proper use of their eyes was often the key factor in developing proper athletic performance. "Because of my conviction that the proper use of the eyes is so important in sports, it seems to me that optometrists

as experts in visual science should play a much larger role in advising and counseling coaches and athletes."[38]

Getz quotes baseball players as saying that they frequently reported that it sometimes felt as if they were playing in "slow motion" and had much more time to hit the ball correctly following a visual training program. He also states that it was refreshing to hear athletics say that for the first time they had found something new (referring to visual training) which has helped their game.[39]

In recognizing the growing interest in vision care for athletes, the delegates to the American Optometric Association's 1978 Congress approved the formation of a Section on Sports Vision with Dr. Donald Getz serving as the chairman.[40]

Prevalence Of Visual Training In Professional Baseball

A questionnaire survey (see pages 20 and 21) was sent to every professional baseball organization to determine if their organization was currently using a visual training program or had used one in the past. Since professional baseball is a very competitive business, the letter that accompanied the questionnaire made it clear that all information would be confidential and no team names would be used. Of the twenty-six teams, twenty-one (81%) returned the questionnaire. One organization wrote that they received the questionnaire but due to the volume of requests or because some of the questions involved priviledged information, they declined to fill out the questionnaire. It was interesting to note that ten organizations (50% of the teams that replied) did not even have a visual consultant. Of the ten organizations that had visual consultants, only two were employed on a full-time basis. Six of the consultants were team physicians, one was an opthalmologist, two were optometrists, and one organization had both an ophthalmologist and an optometrist. Two of the organizations that responded were currently conducting a visual training program.

Fourteen of the teams that responded (70%) indicated that they never have used a visual training program. One organization listed the expense of such a program for their reason for not having one. Another listed expense and poor cooperation of the players when the general manager was with another team that had a training program.

One listed the expense and stated that it would be hard to tell if a program would help. Three organizations indicated that they didn't feel a visual training program was of any value. Four indicated that they were not aware of such training. One listed poor cooperation of the players in such programs. Another organization stated that such a program was investigated but other medical programs (such as prevention and rehabilitation from physical injuries) had taken priority. One organization indicated that they have never been informed as to what can be gained through such a program. Another organization stated that the definition and creditability of visual training is lacking, that it wasn't true that studies indicated visual training appeared to significantly increase the performance of athletes, and that the authors assumed visual training is valid and that this was a too biased point of view. The last opinion was of an ophthalmologist that was the visual consultant to the organization. Of the two teams that had visual training programs, one stated that they discontinued the program because they were dissatisfied with the results and the other stated that it was not properly followed through with by the players. Two organizations failed to fill out the part of the form asking about the visual training program.

One of the organizations that is currently using a visual training program stated that they were doing so at the minor league level and were in the process of implementing the program at the major league level in 1980. The visual consultant conducting the

program is an optometrist. This organization indicated that they were training hand-eye-body coordination, accommodative facility, convergence facility, and distance and space discrimination visual enhancement. Players that were involved in the program was variable depending on need. The other organization currently using a visual training program is in the process of evaluating their program. The visual consultant conducting this program is also an optometrist. The organization indicated that they were training binocularity or depth perception, peripheral acuity, and distance and space discrimination visual enhancement. Players that are involved in the program is also variable depending on need.

Conclusion

The survey revealed that visual training programs in professional baseball are not widely used. The two teams that had a visual training program discontinued the program due to poor cooperation by the players or were dissatisfied with the results. The two organizations that are currently using a program could not assess the value of their programs because of the limited amount of time that they have been in effect. From the results of this survey, the authors feel that there is a great need for optometrists to provide professional baseball organizations with a visual training program that can improve the performance of their athletes. The optometrist that is interested in sports vision should contact these organizations and educate the management, coaches, and athletes of the benefits that a visual training program could provide for their organization. It may be best for the optometrist to work individually with interested players instead of working with the team as a whole. In this manner, the optometrist can utilize his/her time optimally, can avoid wasting time with unmotivated players, and provide the professional baseball organization with the best vision care at the least expense.

THE ROLE OF VISUAL TRAINING IN MAJOR LEAGUE BASEBALL

1. Does your organization presently have a visual consultant?

   ☐ Yes
   ☐ No

   If Yes, is the consultant:

   ☐ Part time
   ☐ Full time

2. Are you currently using a visual training or visual enhancement program?

   ☐ Yes
   ☐ No

   If Yes:

   a) Which areas do you train in your program?
      ☐ Hand-eye-body coordination
      ☐ Accommodative facility
      ☐ Convergence facility
      ☐ Binocularity or depth perception
      ☐ Ocular motilities
      ☐ Rhythm training
      ☐ Visual enhancement
         1) ☐ Peripheral acuity
         2) ☐ Distance and space discrimination
      ☐ Other (please specify)

   b) Who administers your program?
      ☐ Optometrist
      ☐ Ophthalmologist
      ☐ Certified orthoptic technician
      ☐ Team trainer
      ☐ Team physician
      ☐ Other (please specify)

   c) Are you satisfied with the results of your program?
      ☐ Major value with significantly increased performance
      ☐ Slight value with only slightly increased performance
      ☐ Dissatisfied with program results
      ☐ Uncertain whether or not program produces desirable results

   d) How long have you had your program?
      ☐ 1 - 2 years
      ☐ 2 - 5 years
      ☐ 5 - 10 years
      ☐ 10 years or more

   e) Who participates in the program?
      ☐ Entire team
      ☐ Selected team members (please specify whether the selection is based on position played or an individual basis)
      ☐ Variable

3. If your organization does not presently have a visual training program:

   a) Why not?
      - ☐ Expense
      - ☐ Don't feel it has any value
      - ☐ Was not aware such training is available
      - ☐ Have had a program but have discontinued it because:
        1) ☐ Dissatisfied with results
        2) ☐ Too time consuming
        3) ☐ Poor cooperation by players
        4) ☐ Other (please specify)

   b) Are you aware of recent studies which seem to indicate that visual training appears to significantly increase the performance of the visually trained athlete?
      - ☐ Yes
      - ☐ No

   c) Would your organization like to receive a list of the recent studies done in this area?
      - ☐ Yes
      - ☐ No

4. Does your organization desire a copy of the results obtained in this study?

   - ☐ Yes
   - ☐ No

5. The person(s) answering this survey is(are):

   - ☐ Team physician
   - ☐ Team trainer
   - ☐ Team visual consultant
   - ☐ Other (please specify)

Comments:

References

1. Wold RM, Pierce J, Keddington J: Effectiveness of Optometric Vision Therapy. J AM OPTOM ASSOC 49(9): 1047-1054, Sept 1978.

2. Schor C, Flom MC: The Relative Value Of Stereopsis As A Function Of Viewing Distance. AM J OPTOM ARCH AM ACAD OPTOM 46(11): 805-809, Nov 1969.

3. Wittenberg S, Brock F, Folsom W: Effect of Training On Stereoscopic Acuity. AM J OPTOM ARCH AM ACAD OPTOM 46(9): 645-653, Sept 1969

4. Wold RM, Pierce J, Keddington J: OP CIT p 1051

5. IBID. p 1051.

6. Hoffman L, Cohen AH, Ferer G: Effectiveness Of Non-Strabismus Optometric Vision Training In A Private Practice. AM J OPTOM ARCH AM ACAD OPTOM 50(9): 813-816, Sept 1973.

7. IBID. p 815.

8. Wold RM, Pierce J, Keddington J: OP CIT. p 1050-1051.

9. Koch CC: Visual Training And Sports. AM J OPTOM ARCH AM ACAD OPTOM 26(1): 29-30, Jan 1949.

10. Runninger J: Rx For Sports. OPTOM MANAGE 55(6): 55-68, June 1979.

11. Getz DJ: Vision And Sports. J AM OPTOM ASSOC 49(4): 385-388, Apr 1978.

12. Hoffman L, Cohen AH, Feuer G: OP CIT. p 815.

13. Koch CC: OP CIT. p 30.

14. Wick B: Vision Training For Presbyopic Nonstrabismic Patients. AM J OPTOM PHYSIOL OPTICS 54(4): 244-247, Apr 1977.

15. Runninger J: OP CIT. p 55,67.

16. Runninger J: Vision Requirements Of Competitive Sports. SOUTH J OPTOM 17(2): 13-15, 18, Feb 1975.

17. Schor C, Flom M: OP CIT. p 808.

18. Runninger J: OP CIT. p 14.

19. Runninger J: You Can't Hit'em If You Don't See'em! OPTOM WEEKLY 62(16): 27-31, Apr 8, 1971.

20. Trachtman J: The Relationship Between Ocular Motilities And Batting Averages In Little Leaguers. AM J OPTOM ARCH AM ACAD OPTOM 50(11): 914-919, Nov 1973.

21. Falkowitz C, Mendel H: The Role Of Visual Skills In Batting Averages. OPTOM WEEKLY 68(20): 33-36, May 26, 1977.

22. Getz DJ: OP CIT. p 386.

23. Beals RP, Mayyasi AM, Templeton AE Johnston WL: The Relationship Between Basketball Shooting Performance And Certain Visual Attributes. AM J OPTOM ARCH AM ACAD OPTOM 48(7): 585-590, July 1971.

24. Falkowitz C, Mendel H: OP CIT. p 35.

25. Runninger J: OP CIT. p 15.

26. Getz DJ: OP CIT. p 388.

27. Tivnan F: Eye Doctor Scores A Hit In Baseball. BOSTON SUNDAY HERALD: p 20A, Oct 28, 1962.

28. Koch CC: OP CIT. p 30.

29. Runninger J: OP CIT. p 27.

30. Getz DJ: OP CIT. p 385, 386.

31. Editorial: Optometry's Role In Sports. OPTOM MANAGE 15(6): 35-49, June 1979.

32. Soder A: The Double Life Of Dr. Thomas. OPTOM MANAGE 14(9): 89-93, Sept 1978.

33. Pollock DE: Screening Athletes - How Important Is Sports Vision Care? REV OPTOM 114(8): 14-18, Aug 1977.

34. Tivnan F: OP CIT. p 20.

35. Editorial: OP CIT. p 35-49.

36. Martin W: What The Coach Should Know About The Vision Of Athletes, OPTOM WEEKLY 61(25): 24-26, June 18, 1970.

37. Sutherland B: A Portrait Of The O.D. As A Football Nut. REV OPTOM 116(11): 104, Nov 15, 1979.

38. Collier B: The Eyes Lead The Body. OPTOM MANAGE 15(6): 73-80, June 1979.

39. Getz DJ: OP CIT. p 388.

40. Soder A: OP CIT. p 93.